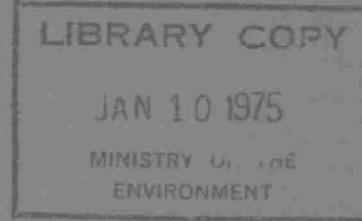


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OPERATING SUMMARY

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KINGSTON TWP.

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REGIONAL OPERATIONS DIVISION

DIRECTOR, SOUTHEASTERN REGION

E. McIntyre

MANAGER, UTILITY OPERATIONS

A. Symmonds

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KINGSTON TWP.

WATER POLLUTION CONTROL PLANT

operated for

THE TOWNSHIP OF KINGSTON

by the

MINISTRY OF THE ENVIRONMENT

1973 ANNUAL OPERATING SUMMARY

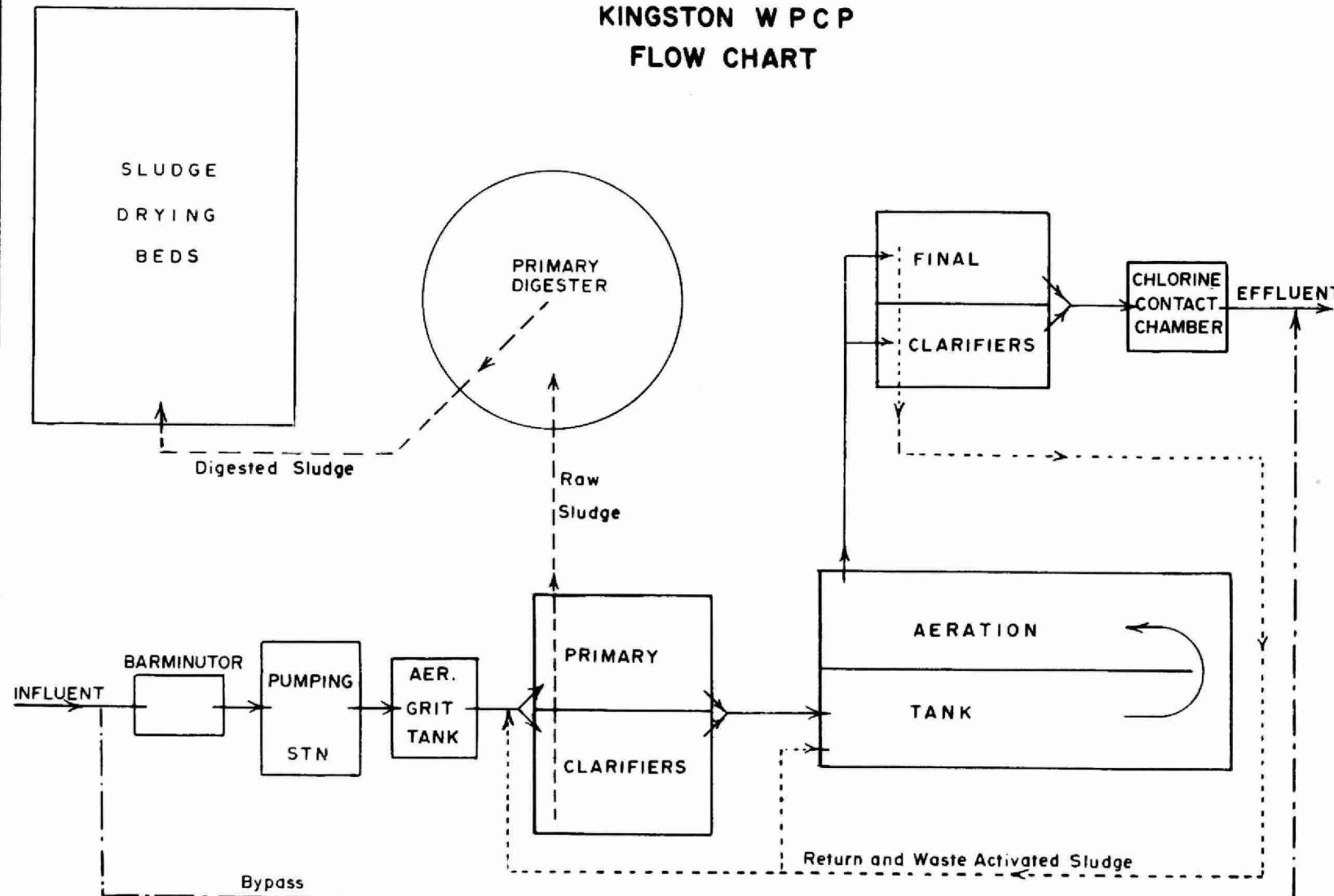
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KINGSTON WPCP FLOW CHART



DESIGN DATA

PROJECT NAME Kingston Twp WPCP
PROJECT NO. 2-0098-61

TREATMENT Activated Sludge

DESIGN FLOW 0.83 mgd

DESIGN POPULATION 10,000

BOD - Raw Sewage 210 mg/l

SS - - Raw Sewage 250 mg/l

PRIMARY TREATMENT

Comminution

Type: C. P. Barminutor
Size: One Model C (18')

Sewage Lift Pumps

Type: Weinman Type VBM
Size: Two 1200 gpm @ 35' tdh

Grit Removal

Type: Aerated; grit removed by air
lift
Size: 1920 gal
Retention: 2 min

Primary Sedimentation

Type: Falk
Size: Two 46' x 12' x 7'7" deep
(8,380 cu ft or 52,200 gal)
Retention: 1.5 hours
Loading: Surface, 750 gal/ft²/day
Weir, 8,600 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; Two-pass
Size: One tank 62' x 22.5' x 15'
(each pass) (41,900 cu ft
or 262,000 gal)
Retention: 7.6 hours

Air Supply

Type: Roots-Connersville
Size: Two 880 scfm

Diffusers

Type: C. P. Discfuser
Space: 63 diffusers per pass
(wide band)

Secondary Sedimentation

Type: Falk
Size: Two 56' x 12' x 9' deep
(12,100 cu ft or 75,600 gal)
Retention: 2.2 hours
Loading: Surface, 562 gal/ft²/day
Weir, 5,050 gal/ft/day

CHLORINATION

One W & T (100 lb/day)

Chlorine Contact Chamber

Size: One 27' 9" x 9' x 8' deep
(10,300 gal)
Retention: 18 min

OUTFALL

3,000 ft to Lake Ontario

SLUDGE HANDLING

Digestion System

Type: Single stage, mixed by sludge
recirculation
Size: One 55' dia x 20' swd
(54,500 cu ft or 340,000 gal)
Loading: 0.57 lb/cu ft/mo
Recirculation pump - one Weinman:
150 gpm @ 65'

Sludge Drying Beds

Four 80' x 20' (6,400 sq ft)

'73 Review

GENERAL

The addition of polyelectrolytes at the Water Pollution Control Plant was discontinued early in the year as the improvement in plant performance no longer justified the high chemical costs. The deterioration in effectiveness of this and other types of chemical treatment experimented with, such as hydrogen peroxide, resulted from increasing hydraulic overloading. Following abandonment of chemical treatment, the plant flow was split with flows up to 1.0 million gallons per day receiving full secondary treatment and flows in excess of 1.0 million gallons per day receiving only primary treatment. Year-round chlorination of all flows commenced in March of 1973.

A pilot plant research study conducted by staff of the Royal Military College and Queens University was completed during the year. The study, concerning the effect of adding alum sludge from a water treatment plant to sewage entering a water pollution control plant, concluded that the addition of alum sludge improved the efficiency of the water pollution control plant in the removal of phosphorus from the sewage.

A program to coat the pump shaft sleeves at all of the pumping stations with a ceramic coating to reduce maintenance costs was initiated. The Flowmatcher controls in the Days Road and Crerar Street pumping stations were removed and the pumps converted to single-speed stop/start operation. The Collins Bay pumping station generator building brickwork was repointed. This building has suffered structural deterioration and may have to be reconstructed in the near future.

Tenders were received in December for expansion of the plant, tripling its capacity to 2.4 million gallons per day. Construction is scheduled to commence early in 1974.

EXPENDITURES

The cost of operating the sewage works in 1973 was \$60020, slightly lower than in the previous year and within the operating budget. The cost of treating one million gallons of sewage was \$105, down from \$117 per million gallons in 1972.

PLANT PERFORMANCE

Flows for the year totalled 569 million gallons, up from 549 million gallons during the previous year. The average daily flow increased from 1.50 million gallons per day in 1972 to 1.56 million gallons per day in 1973.

The sewage BOD was reduced by 56 per cent from an influent concentration averaging 290 mg/l to an effluent concentration of 130 mg/l. The sewage suspended solids was reduced by 45 per cent from an influent concentration averaging 270 mg/l to an effluent concentration of 150 mg/l. Phosphorus concentrations averaged 9.1 mg/l in the influent and 7.4 mg/l in the effluent, for a reduction of 19 per cent.

A total of 1.296 million gallons of raw sludge was pumped to the digesters. Of the 148 thousand gallons of digested sludge removed from the plant, 73 thousand gallons was hauled in liquid form for land disposal and the remaining 75 thousand gallons was directed to the drying beds. The plant effluent was disinfected with a total of 16.7 thousand pounds of chlorine.

PLANT LOADING

Flows during 1973 averaged 188 per cent of plant design capacity, up from 181 per cent in 1972. The BOD loading decreased from 270 per cent of design capacity in 1972 to 260 per cent in 1973. The suspended solids loading increased from 184 per cent of design capacity in 1972 to 203 per cent of design capacity in 1973.

The pumping stations within the sewage collection system have sufficient capacity to handle normal sewage flows. However, the Days Road and Crerar Street pumping stations are unable to handle the surges of flow during periods of wet weather, due to rain water entering the sanitary sewer system.

CONCLUSIONS

The plant efficiency was very poor as a result of severe hydraulic and organic overloading. The quality of the plant effluent was also very poor, averaging 130 mg/l BOD and 150 mg/l suspended solids. These concentrations are equivalent to the strength of raw sewage in many municipalities.

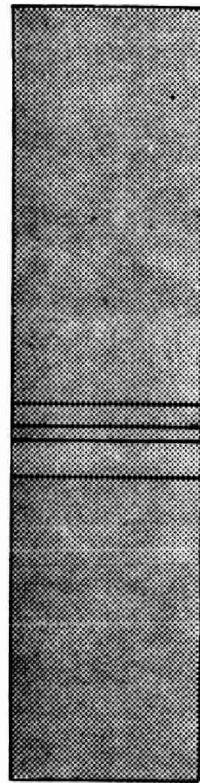
Expansion of the plant to 2.4 million gallons per day capacity scheduled for completion by the end of 1974 is an absolute necessity. However, even the expanded plant may be overloaded hydraulically during periods of wet weather unless continuing efforts are made by the municipality to locate points of entry of rainwater to the sanitary sewer system and eliminate these flows.

The plant superintendent, Mr. Jack Cleland and his capable staff are to be commended for their high standards of maintenance and operation under very trying conditions.

OPERATING EXPENDITURES

| | |
|---|-----------------|
| SALARIES AND WAGES | <u>\$30,445</u> |
| EMPLOYEE BENEFITS | <u>1,722</u> |
| TRANSPORTATION & COMMUNICATIONS | <u>1,135</u> |
| SERVICES | <u>3,028</u> |
| SUPPLIES AND EQUIPMENT | <u>23,690</u> |
| ACQUISITION/CONSTRUCTION OF PHYSICAL ASSETS | <u>0</u> |
| TRANSFER PAYMENTS | <u>0</u> |
| OTHER TRANSACTIONS | <u>0</u> |
| TOTAL | <u>\$60,020</u> |

ANNUAL COSTS



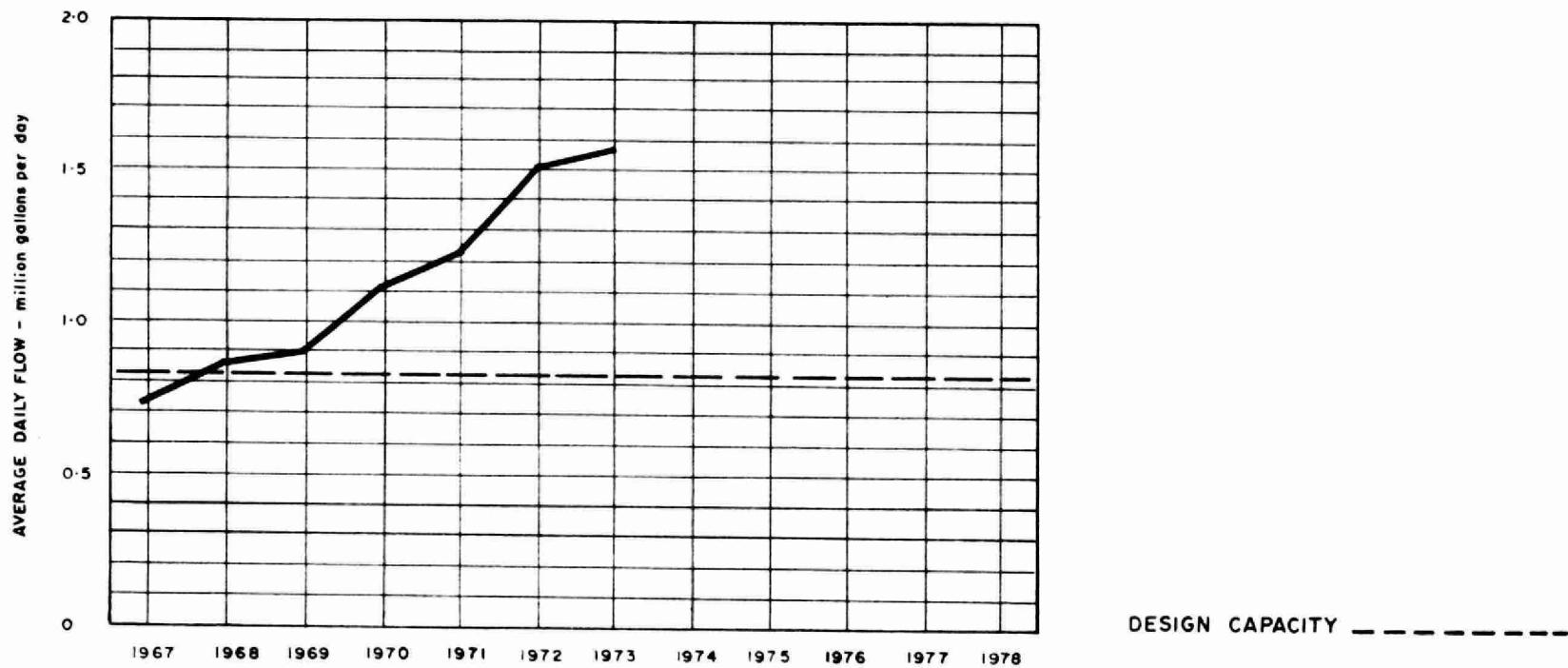
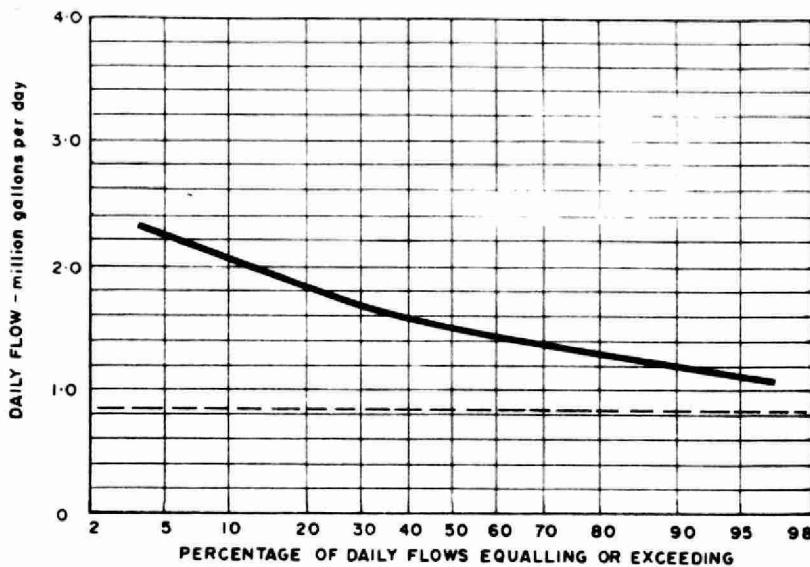
1973 OPERATING COSTS

| | |
|--|------|
| ● SALARIES & WAGES | 51 % |
| ● EMPLOYEE BENEFITS | 3 % |
| ● TRANSPORTATION & COMMUNICATIONS | 2 % |
| ● SERVICES | 5 % |
| ● SUPPLIES & EQUIPMENT | 39 % |
| ● AQUISITION/CONSTRUCTION OF PHYSICAL ASSETS | NIL |
| ● TRANSFER PAYMENTS | NIL |
| ● OTHER TRANSACTIONS | NIL |

YEARLY OPERATING COSTS

| YEAR | SEWAGE TREATED in million gallons | TOTAL OPERATING COSTS | UNIT COSTS | |
|------|--------------------------------------|--------------------------|------------|----------|
| | | | \$/M.G. | t/lb BOD |
| 1968 | 314 | \$ 36,456 | 116 | 2 |
| 1969 | 345 | 39,254 | 114 | 3 |
| 1970 | 408 | 44,857 | 110 | 7 |
| 1971 | 454 | 51,491 | 113 | 8 |
| 1972 | 549 | 64,452 | 117 | 5 |
| 1973 | 569 | 60,020 | 105 | 2 |

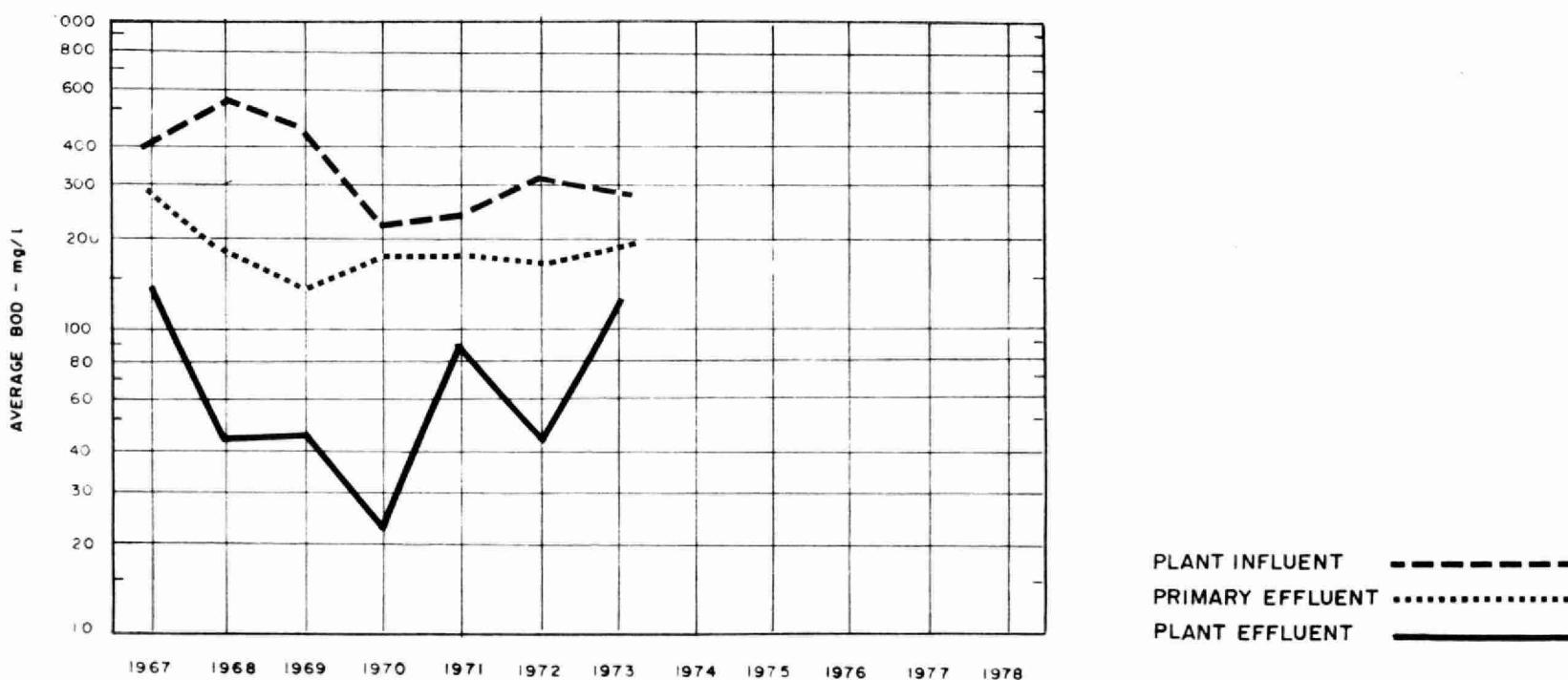
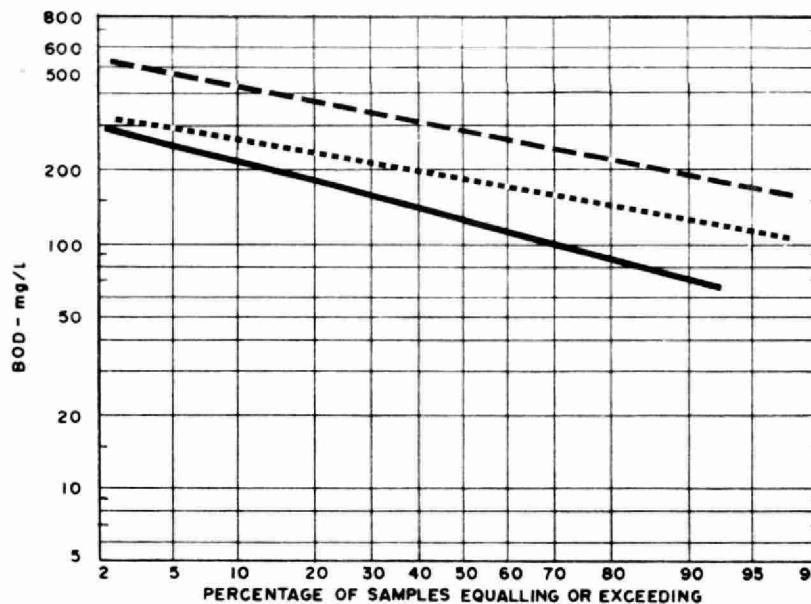
PROCESS DATA FLOWS



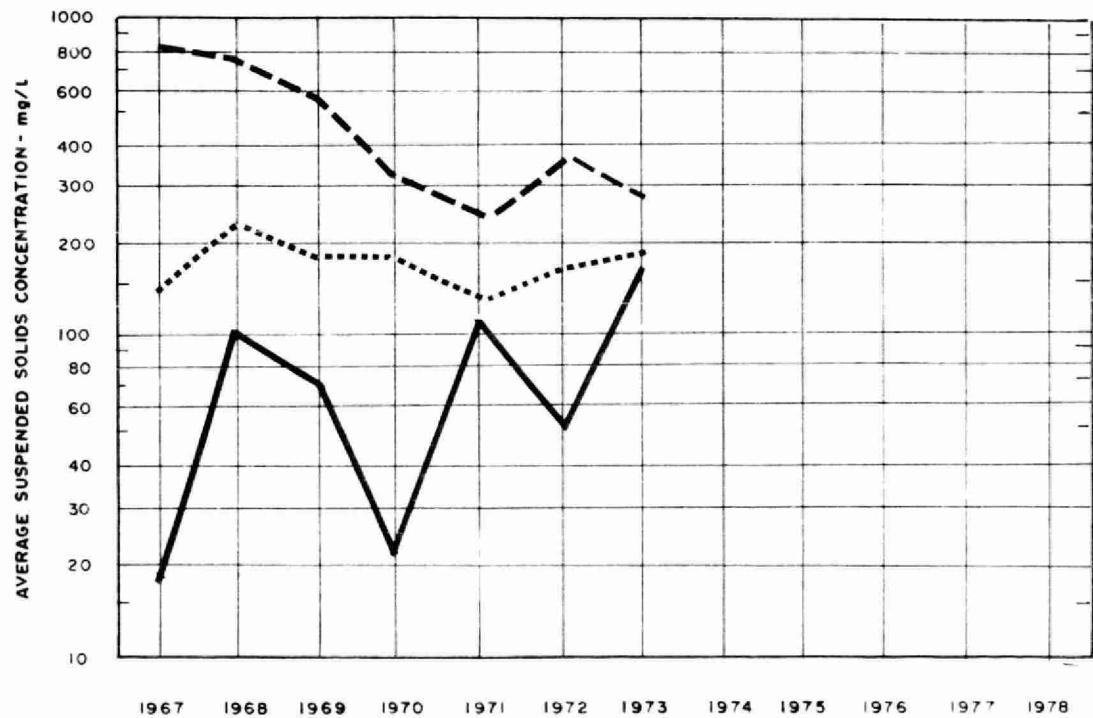
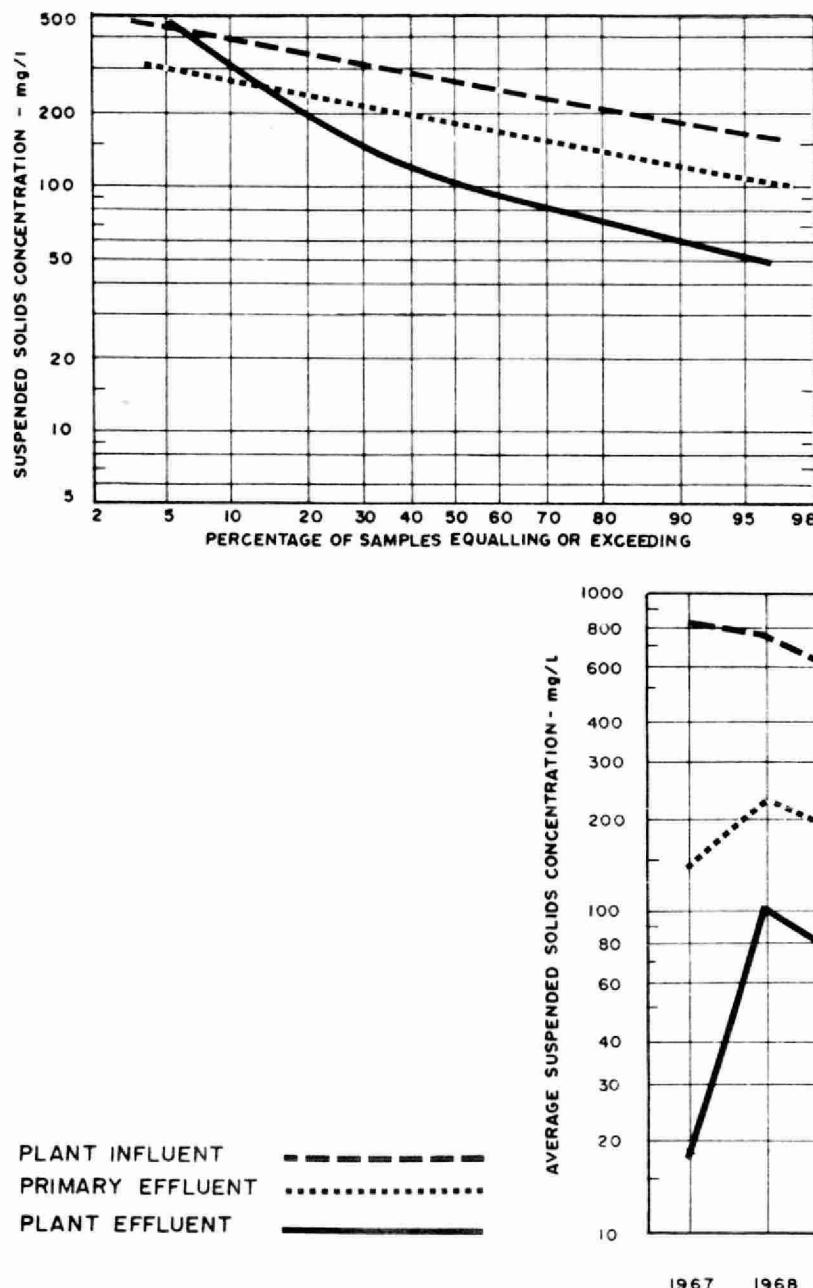
PLANT PERFORMANCE

| MONTH | FLOWS | | | BIOCHEMICAL OXYGEN DEMAND | | | | SUSPENDED SOLIDS | | | | PHOSPHORUS | |
|----------------|-------------------------------|----------------------------|-----------------------|---------------------------|------------------|-----------|---------------------------|------------------|------------------|-----------|---------------------------|--------------------|--------------------|
| | TOTAL FLOW million gallons | AVERAGE DAY mil. gal | MAXIMUM DAY mgd | INFLUENT mg/l | EFFLUENT mg/l | REDUCTION | | INFLUENT mg/l | EFFLUENT mg/l | REDUCTION | | INFLUENT mg/l P | EFFLUENT mg/l P |
| | | | | | | % | 10 ³ pounds | | | % | 10 ³ pounds | | |
| JAN | 49.81 | 1.61 | 2.38 | 260 | 100 | 60 | 78 | 260 | 150 | 43 | 55 | 11.0 | 7.3 |
| FEB | 36.42 | 2.80 | 2.39 | 280 | 120 | 56 | 64 | 310 | 130 | 58 | 64 | 11.0 | 9.4 |
| MAR | 49.03 | 1.58 | 2.38 | 260 | 150 | 41 | 51 | 250 | 210 | 16 | 20 | 11.0 | 8.4 |
| APR | 52.34 | 1.74 | 2.42 | 220 | 130 | 41 | 48 | 190 | 130 | 32 | 32 | 6.5 | 4.5 |
| MAY | 44.42 | 1.43 | 1.70 | 310 | 150 | 52 | 72 | 270 | 91 | 66 | 78 | 9.7 | 6.4 |
| JUNE | 40.28 | 1.34 | 1.73 | 300 | 110 | 64 | 79 | 240 | 83 | 66 | 64 | 8.4 | 6.4 |
| JULY | 40.69 | 1.31 | 1.57 | 280 | 98 | 64 | 72 | 230 | 140 | 41 | 39 | 6.2 | 10.0 |
| AUG | 44.87 | 1.45 | 2.11 | 280 | 180 | 38 | 48 | 240 | 240 | 0 | 0 | 7.5 | 16.0 |
| SEPT | 46.13 | 1.54 | 2.17 | 290 | 100 | 65 | 87 | 430 | 230 | 45 | 89 | 4.5 | 5.0 |
| OCT | 48.14 | 1.55 | 2.19 | 340 | 120 | 64 | 104 | 270 | 110 | 60 | 78 | 7.8 | 5.4 |
| NOV | 55.73 | 1.86 | 2.39 | 360 | 130 | 57 | 124 | 310 | 180 | 40 | 69 | 4.6 | 3.8 |
| DEC | 60.90 | 1.96 | 2.41 | 340 | 130 | 62 | 128 | 300 | 97 | 67 | 121 | | |
| TOTAL | 568.76 | - | - | - | - | - | 955 | - | - | - | 709 | - | - |
| AVG. | | 1.56 | 2.42 | 290 | 130 | 56 | 80 | 270 | 150 | 45 | 59 | 9.1 | 7.4 |
| No. of Samples | - | - | - | 61 | 61 | - | - | 61 | 60 | - | - | 15 | 15 |

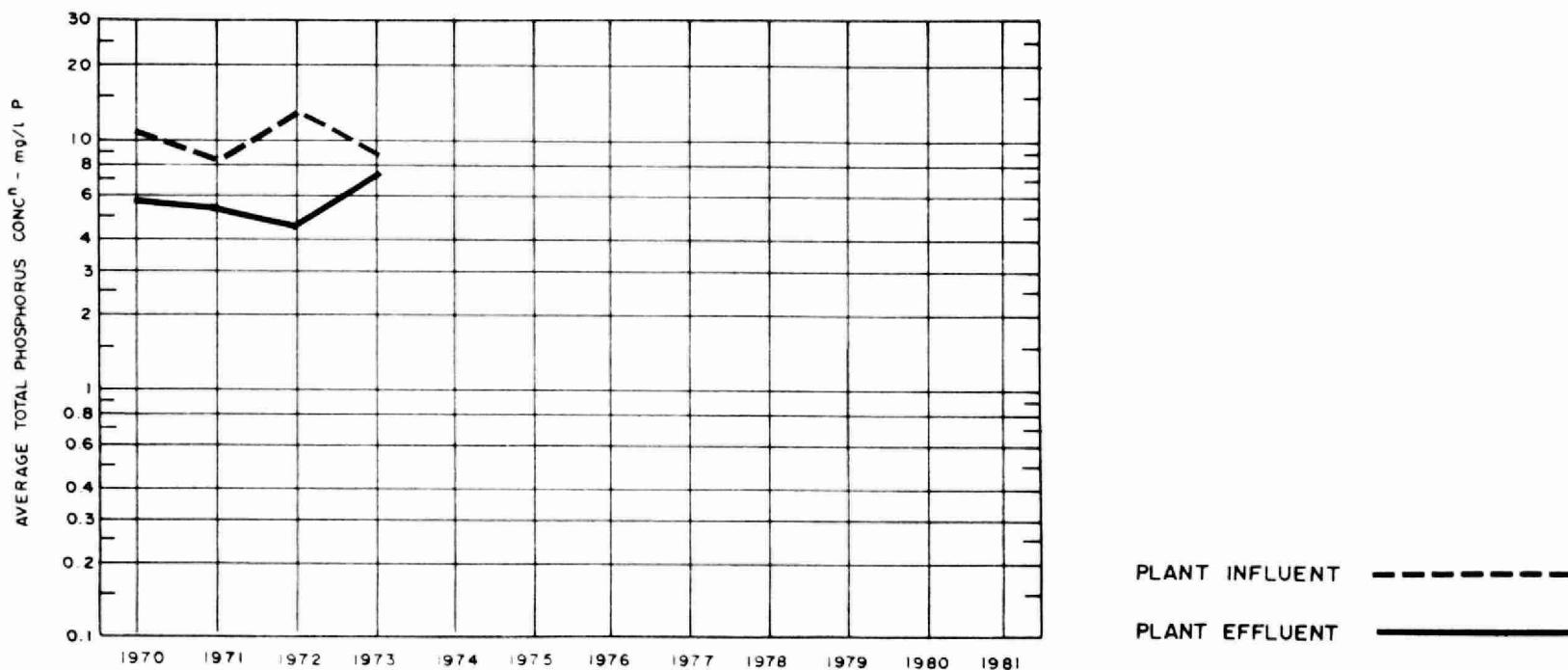
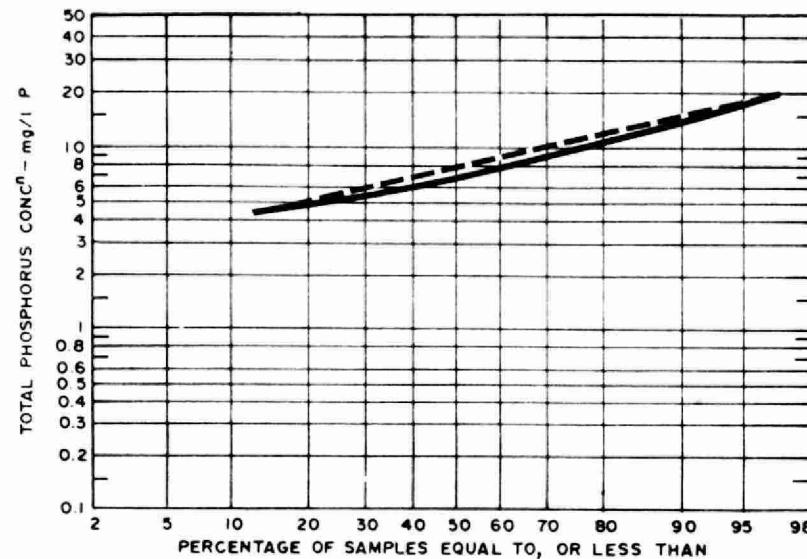
BIOCHEMICAL OXYGEN DEMAND



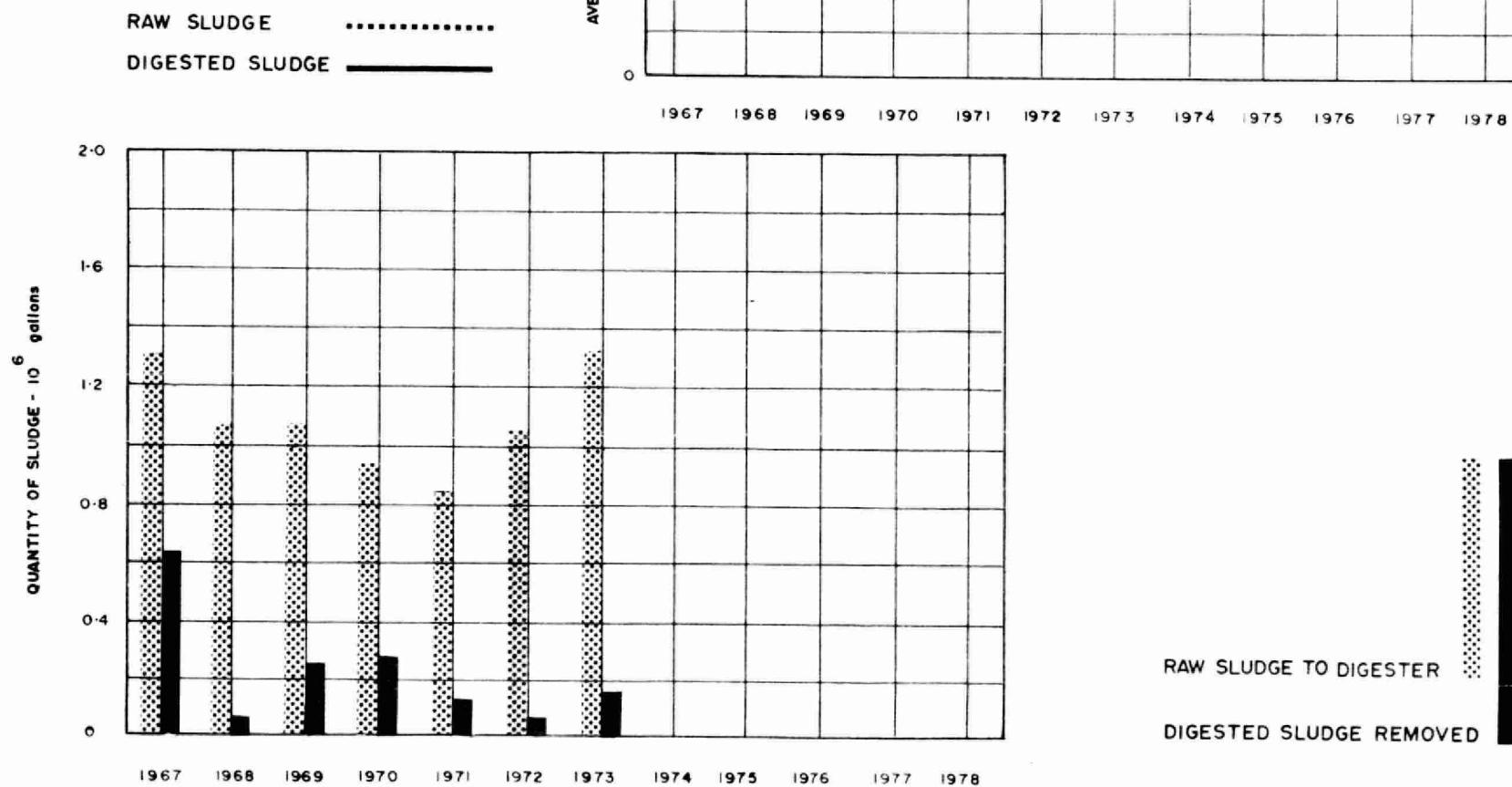
SUSPENDED SOLIDS



PHOSPHORUS



DIGESTION



TREATMENT DATA

| MONTH | GRIT | CHLORINATION | | PRIMARY EFFLUENT | | AERATION | | | SLUDGE DIGESTION and DISPOSAL | | | | | | | | |
|--------------|-------------------------|--------------------------------|--------------------------------|------------------|----------|--------------------------|-------------------|----------|---------------------------------------|-------------------|------------------|-------------------------|-------------------|------------------|-------------------------|------------------------|------------------------------|
| | | QUANTITY REMOVED cubic feet | CL ₂ USED pounds | Avg Dose mg/l | BOD | SUSPENDED SOLIDS mg/l | MLSS CONC mg/l | F/M | AIR 1000 ft ³ lb BOD | RAW SLUDGE | | | DIGESTED SLUDGE | | | SUPER-NATANT T.S. % | AMOUNT HAULED cubic yards |
| | | | | | mg/l | mg/l | day ⁻¹ | | 10 ³ gallons | Total Solids % | Vol. Solids % | 10 ³ gallons | Total Solids % | Vol. Solids % | 10 ³ gallons | Vol. Solids % | |
| JAN | 50 | | | | 190 | 130 | 1530 | 0.35 | 1.0 | 79 | | | 10 | | | 0.06 | |
| FEB | 10 | | | | 230 | 200 | 2150 | 0.27 | 0.9 | 104 | | | 10 | 7.0 | | 0.11 | |
| MAR | 25 | 602 * | 2.1 | | 150 | 200 | 2020 | 0.18 | | 105 | | | 18 | 2.5 | 28 | 0.10 | |
| APR | 54 | 1056 | 2.5 | | 210 | 150 | 2620 | 0.16 | 1.2 | 105 | | | | | | 0.08 | |
| MAY | 25 | 1961 | 4.4 | | 240 | 170 | 3210 | 0.15 | 1.1 | 125 | | | 10 | 9.0 | | 0.08 | |
| JUNE | 25 | 1770 | 4.7 | | 190 | 140 | 2720 | 0.15 | 1.1 | 121 | | | 16 | 7.2 | | 0.17 | |
| JULY | 50 | 1784 | 4.4 | | 180 | 160 | 3050 | 0.01 | 0.9 | 105 | | | 18 | 6.0 | | | 103 |
| AUG | 25 | 1613 | 3.6 | | 200 | 170 | 2740 | 0.02 | 0.9 | 110 | | | 20 | 7.0 | | | 59 |
| SEPT | 30 | 1723 | 3.7 | | 200 | 360 | 660 | 0.65 | 8.2 | 109 | | | 15 | | | | 90 |
| OCT | 30 | 1486 | 3.1 | | 200 | 190 | 1570 | 0.27 | 0.8 | 112 | | | 15 | | | 0.20 | 90 |
| NOV | 50 | 2069 | 3.7 | | 210 | 230 | 2300 | 0.19 | 0.7 | 112 | 6.0 | | 5 | 7.0 | | 0.05 | 30 |
| DEC | 27 | 2673 | 4.4 | | 220 | 200 | 2810 | 0.17 | 0.7 | 109 | 3.0 | | 11 | 9.0 | | | 64 |
| TOTAL | 401 | 16737 | - | - | - | - | - | - | - | 1296 | - | - | 148 | - | - | - | |
| AVG. | 0.7 cu. ft./min. gal | 1395 | 2.9 | | 200 | 190 | 2280 | 0.21 | 1.6 | 108 | 4.5 | | 12 | 6.8 | 28 | 0.11 | 73 |

* Started March 14th

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